# Now and Future: Looking at Fukushima

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1. Great East Japan Earthquake and Fukushima Daiichi Nuclear Plant Disaster (1)

➤ Distinctive Character of the Fukushima Nuclear Plant Disaster Fukushima Nuclear Plant Accident in Context (Intersection of Hiroshima – Nagasaki – Fukushima and Harrisburg – Chernobyl – Fukushima → Fukushima's place among the world's nuclear disasters)



#### 1. Great East Japan Earthquake and Fukushima Daiichi Nuclear Plant Disaster (2)

Designation of contamination status priority survey area and status of municipal decontamination planning based on Special Measures Act





fig.2 Priority decontamination areas by central government

Priority decontamination areas by central government are designated by doze level where are over 20mSv/year and inner areas less than 20km from the nuclear plants

fig.1 Priority survey areas

Priority survey areas are designated by doze level where are over  $0.23\mu$ Sv/hour

- Distinctive Character of the Fukushima Nuclear Plant Disaster
  - -Triple Disaster (earthquake, tsunami, nuclear plant accident) & "plus alpha"
  - -Initial Tragedy (state and municipality governance at time of disaster)
    - Tragic evacuations resulting from inadequate information
       "Isolated" policy making on evacuation by municipal leaders
    - •Excessive "decontamination" expectations "Decontamination" ought to be one choice for "radiological protection" But decontamination has barely progressed, as effectiveness and limits of decontamination gradually became clear and as it has been difficult to reach decisions about where to store decontamination material.
    - Disorganized response to "decontamination," "restitution," "return," "reconstruction"
  - Official declaration that "the nuclear plant accident is under control" confusing for residents; efforts to restart the nuclear plant
  - Evacuation and recovery/reconstruction: ever longer, ever expanding, and ever more complex

## Nuclear Plant Disaster 2 - 1 Initial Response (2) Namie Town, Fukushima

3/11	14:46 15:33 15:42 21:23	<ul> <li>M9.0 earthquake hits, Namie Town registers an upper 6 on the Japanese seismic scale</li> <li>Severe damage throughout town, including toppled buildings and damaged roads</li> <li>Namie Town coastline is struck by the first wave of the giant tsunami, then struck repeatedly by subsequent waves</li> <li>184 people dead or missing in the earthquake and tsunami, 604 homes washed away</li> <li>Most residents evacuate to 12 facilities in town</li> <li>TEPCO notifies government that power has been lost at Daiichi Plant (*Namie Town is not contacted)</li> <li>Government orders residents within 3km radius of Daiichi Plant to evacuate</li> <li>Government orders residents within 3-10km radius to remain indoors (Namie Town not contacted)</li> </ul>
3/12	05:44 13:00 15:36 18:25 Evening to night	Government orders residents within 10km radius to evacuate (*Namie Town not contacted) Namie Town is also instructed to evacuate beyond 10km radius, and evacuation begins Namie Town decides to relocate Disaster Response Headquarters to the Tsushima branch office Hydrogen explosion occurs at Reactor 1 Government orders residents within 20km radius to evacuate (*Namie Town not contacted) Namie Town also instructed to evacuate beyond 20km radius, and evacuation begins
3/14	11:01	Hydrogen explosion occurs at Reactor 3
3/15	04:30 06:00 06:10 10:00 11:00 During same day	Namie Town makes its own decision to evacuate beyond town, coordination with Nihonmatsu City begins Explosion heard at Reactor 4 Explosion heard at Reactor 2 Entire town of Namie given order to evacuate (by town mayor), decision is made to evacuate to Nihonmatsu City Government orders residents within 20-30km radius to remain indoors (*Namie Town not contacted) Evacuation center established in Nihonmatsu City, Disaster Response Headquarters established in the city's Towa district
4/22	00:00 09:44	Areas within 20km radius established as nuclear evacuation zone by government Planned evacuation areas established by government Source: Author

3/11	14:46 15:42 21:23	M9.0 earthquake strikes, Disaster Response Headquarters immediately established Minami Soma City takes steps to accept evacuees from Futaba County (up to 1,300 persons) TEPCO notifies government of power loss at Daiichi Plant Government orders residents within 3km radius of the Daiichi Plant to evacuate Government orders residents within 3-10km radius to remain indoors
3/12	05:44 <mark>15:36</mark> 18:25	Government orders residents within <b>10km</b> radius to evacuate Hydrogen explosion occurs at Reactor 1 Government orders residents within <b>20km</b> radius to evacuate
3/14	11:01	Hydrogen explosion occurs at Reactor 3 Evacuees from outside the village leave the village
3/15	06:00 06:10 Noon 18:20	Explosion heard at Reactor 4 Explosion heard at Reactor 2 Radiation levels rise sharply, reaching 15µSv/hr Rise further to 44.7µSv/hr
3/18		Decision made to collectively relocate people requesting evacuation outside the prefecture (Kanuma City Athletic Center)
3/30		IAEA advises the government that radiation levels have reached twice the standard level for evacuation and that evacuation advisory should be issued
3/31		Government rejects IAEA advisory
4/4		Kyoto University's Imanaka and others recommend evacuation to low-concentration areas, and evacuation beyond the village for children and pregnant women
4/6		Decision is made to evacuate pregnant women and children under 3 years of age beyond the village
4/11		Government announces establishment of "Planned Evacuation Areas"
4/22		Official document for "Designation of Planned Evacuation Areas" is issued by the government
5/9		Entire village evacuation plan is submitted to prefecture
5/15		Evacuation Phase 1 (households with infants/toddlers or pregnant women, households with children under 18, households in areas of high radiation – 1,041 households). Note: completion of entire village evacuation took until early August.

#### Nuclear Plant Disaster 2-2 Prolonged Use of Temporary Emergency Housing (1)



#### Source: Namie Town Reconstruction Vision 7

**Nuclear Plant Disaster 2-2** Prolonged Use of Temporary Emergency Housing (2)

# Behind the supply of wooden temporary housing in Fukushima Prefecture

- •Characteristics of evacuation from Great East Japan Earthquake / Fukushima Daiichi Nuclear Plant Disaster in Fukushima Prefecture
  - $\rightarrow$  ever longer, ever expanding, and ever more complex
  - → supply of temporary housing will probably also require a "two-stage approach"
- "Local recycling-oriented home-building"
  - \*Perspective emphasized when formulating "housing master plan" / "basic housing life plan"
  - \*More comprehensive rebuilding of "local recycling-oriented economic system"

#### **Nuclear Plant Disaster 2-2** Prolonged Use of Temporary Emergency Housing (3)











Photo: Author











Photo: Author

#### Path to Recovery 3-1 Area Classifications by Radiation Contamination (1)



Source: Schematic Maps of Areas Subject to Evacuation Orders and Nuclear Evacuation Zones, 11 Ministry of Economy, Trade and Industry

#### Path to Recovery **3-1** Area Classifications by Radiation Contamination (2)

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Source: 4th Aerial Monitoring Survey (MEXT)

Namie Town's recovery is challenged by radiation contamination

(Government presentation as of December 18, 2011)



150mSv/year	Areas where residents face difficulties in returning
100-150	
50-100	
20-50	Areas with residential restrictions
10-20	
	Areas preparing to have evacuation orders lifted

#### Path to Recovery 3-1 Area Classifications by Radiation Contamination (3)

Zoning revisions proposed to townspeople by Namie Town (1) (Published November 22, 2012 on Namie Town's website)



doses of more than half the surface

ratio, excluding national forests

- Assistance to the ever-longer and ever-expanding evacuation living of evacuees
  - Current condition of evacuee lives
  - Forecasted control of radiation contamination, and subsidy termination period for evacuation facilities and temporary housing (including equivalents to temporary housing) provided under the Disaster Relief Act
    - Expanded application of "Act on Support for Reconstructing Livelihoods of **Disaster Victims**"
    - Support gap for wide-area evacuees (equivalent temporary housing, compensation, health management, residential registration...)
  - •Concrete application of "Act on Support for the Children and Victims of the Nuclear Plant Disaster" (established June 2012)
    - Under the "Chernobyl Act" (1991) areas with radiation exposure exceeding 1mSv are designated "optional evacuation areas," and individuals have a "right to evacuate"
    - Specific details of the Act are to be determined in line with the "Basic Policy" to be compiled by the Minister of Reconstruction and decided upon by the Cabinet, but no decision has yet been made

## Fukushima Prefecture Reconstruction Vision (110810)

#### Three Basic Principles

OSafe and secure society capable of sustainable growth without dependence on nuclear energy

OReconstruction based on the concentrated strength of each and every individual who loves and cares about Fukushima

OHometown rehabilitation that inspires pride

Seven Main Measures

O Emergency response

(1) Emergency restoration; assistance to rebuild lives; municipality reconstruction assistance

OResponding with a vision of Fukushima's future

(2) Raising children and young adults responsible for the future

(3) Rebuilding and expanding local ties between people

(4) Creating industries to lead a new age

(5) Building societies that are resilient against disaster and pioneers of the future

(6) Building new societies through major advances in renewable energy

ONuclear disaster response

(7) Overcoming nuclear disaster

#### Path to Recovery **3** - **3** Hometown Rehabilitation and Reconstruction Vision (2)

#### Namie Town Reconstruction Plan's Basic Principles and Approach to Evacuee Life

- 1. Close contact with affected areas and victims
- 2. What is "recovery/reconstruction"?
  - •What is recovery/reconstruction for a "hometown" (furusato)? For people?
  - •What about recovery assistance policy for people who cannot or do not want to return home?

Rebuild all townspeople's lives – wherever they live, they are townspeople of Namie Town

- 3. Radiation contamination safety and approach to decontamination
- 4. What to do when people say, "we don't know if we have the strength to endure another three years"?

Begin by agreeing on what can be accomplished in three years

- 5. "Resignation" and "resolve" (to not return home for some time) may be needed depending on radiation distribution
- 6. Is existing temporary housing enough?

What about bonds as a community? What about jobs?

Radiation contamination distribution + previous land use → decontamination plan "Housing and Community Step-Up Plan" proposed January 26, **2012** And two community strategies (bonds and coexistence)

#### Namie Town's "external communities" (based on "Reconstruction Vision")



# FAIRDO — Fukushima Action Research on Effective Decontamination Operation—

- Putting decontamination of the Fukushima Nuclear Plant Accident in context
- •Joint research on nuclear plant disaster (governance, decontamination, risk communication)
- •German "Ethics Committee on Providing Safe Energy"
- Partnering with NERIS

Action research on effective decontamination based on conditions in contaminated areas

**Fukushima Action Research on Decontamination Operation** 

Understanding conditions in areas that are contaminated with radioactive material and using European knowledge and experience to contribute effectively to decontamination activities





- Appropriate information sharing, flow of funds, division of responsibilities, etc. are proposed for main entities involved in decontamination (state, prefecture, municipalities, communities, etc.)
- Clarification of the elements needed for effective governance
- Developing trust by sharing research findings domestically and internationally through international symposiums, etc.
- Provide feedback based on general reflection of results of subtopics (2) and (3)
- (2) Drafting decontamination plans based on local conditions
- For decontamination methods to most effectively achieve additional long-term radiation exposure levels (less than 1mSv/year), construct a Japanese-style decontamination model using supplemental monitoring and the adaptation of European models to Japanese conditions.

- (3) Communicating with local residents to encourage collaboration
- To develop trust among local residents and build consensus, establish risk communication methods using region-specific approaches and make use of them in proposed drafting and revision of decontamination plans.

#### Path to Recovery **3-4** Decontamination Measures and International Cooperation (2)

#### FAIRDO 1<sup>st</sup> Discussion Paper "Current Status and Issues of Decontamination in Fukushima"



### [Recommendations]

- "Decontamination" in context
  - "Decontamination at all costs" is an obstacle
  - •European "counter-radiation" strategies ("don't decontaminate" is a decontamination option)
- →Evacuation, health management, food management, employment "Chernobyl Act," 1991, Russia
- → Cannot reach decisions about temporary locations and interim storage sites for contaminated material produced through decontamination
- $\rightarrow$  Clues to effective decontamination and restoration/recovery?

### "Decontamination" issues

- Development of information sharing system for victims
- Participatory stakeholder-style discussion and decision-making
- $\rightarrow$  System by which victims can assess radiation risk for themselves
- $\rightarrow$  Radiation countermeasures and reconstruction/recovery that victims agree with
  - •Organize and strengthen monitoring, including that of decontamination operators
- $\rightarrow$  Countermeasures against improper decontamination and illegal disposal of waste, restoration of trust
  - Development of system for municipalities (cities, towns, villages) to share good practices

#### Path to Recovery **3-4** Decontamination Measures and International Cooperation (4)

# International cooperative networks for radiation hazard management countermeasures: participatory stakeholder information sharing in Europe NERIS (European Platform on Preparedness for Nuclear and Radiological Emergency Response and Recovery)





# Thank you for your attention !